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ABSTRACT

This bulletin has been designed to provide assistance to boards of education, school administrators, teachers, and architects in planning various types of greenhouses and related facilities. Topics discussed include the numerous uses of greenhouses, ideas on design and construction, the growing demand for primary and supporting facilities, evolving job classifications, and recommended acceptable minimum square footages for the various kinds of facilities. Program suggestions are made for the elementary, middle, high, and adult school levels. (Author/MLF)

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GREENHOUSES FOR SCHOOLS

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EDUCATIONAL FACILITY SERIES

A GUIDE TO PLANNING

EA 011 420

State of New Jersey
Department of Education
Division of Field Services
Bureau of Facility Planning
Trenton, New Jersey

GREENHOUSES FOR SCHOOLS

PREPARED BY

Bureau of Facility Planning Services
Division of Field Services
New Jersey State Department of Education
Trenton, New Jersey 08625

1977

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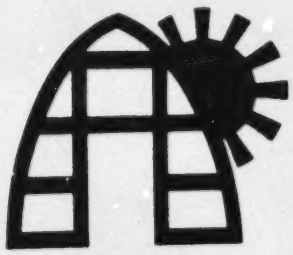

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Joseph E. Nixon
Chief Educational Consultant

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INTRODUCTION

This Bulletin has been designed to provide assistance to boards of education, school administrators, teachers and architects in planning various types of greenhouses and related facilities. With the multiplicity of greenhouse facilities, comprehensive educational specifications are necessary to help the local school district in selecting the proper facility. Detailed information for writing educational specifications is available in bulletin form from the Bureau of Facility Planning Services, New Jersey Department of Education. In the process, school officials should keep in mind that facilities planning only can be effectively done after the programs of instruction have been developed. Further provisions for future expansion should be an integral part of the original plans.

PLANNING IS ESSENTIAL

A greenhouse should be considered an important facility for any elementary, middle or secondary school. It provides useful teaching and experimental areas for environmental science, biology, agriculture and horticulture. Operation throughout the entire school year is possible. Since the environment is at least partially controlled, experiments and demonstrations made possible by artificial environments may be conducted to enrich and reinforce classroom teaching. A well-planned facility will allow the student to learn firsthand the relevance of the principles of the related sciences of chemistry, physics and biology. Their interaction with horticulture sciences may be seen through the use of fertilizers, the effects of light and temperature and the study of insect and disease control.

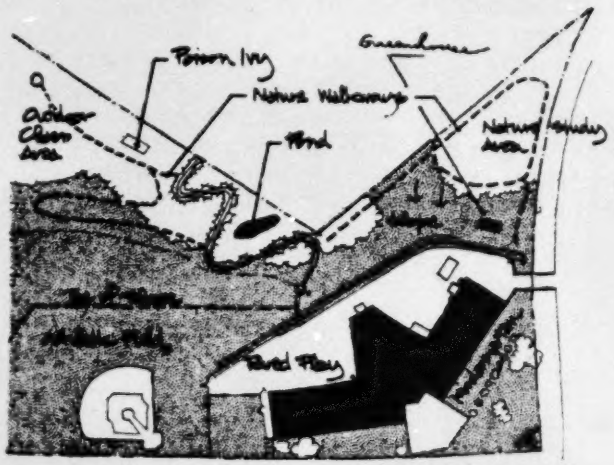
Planning the greenhouse facility for community education programs should not be overlooked. Through an adequately planned and well-equipped facility, programs can be offered to improve the training of adults gainfully employed in agriculture and related programs as well as those who wish preparation for vocational and avocational reasons. This

community shared-time concept of facility utilization is a desirable method of demonstrating the important value of the greenhouse facility and its programs.

CONTINUING EDUCATION

CHOOSING A SITE AND LOCATION

Selecting a parcel of the school site is the first major decision in the construction of a greenhouse. The unit should be constructed on level, well-drained land with good air circulation. A ground-level location usually allows for future expansion. The greenhouse should be attached to or located near a science or agricultural classroom or a shop area so that plants and materials may be transported without going out-of-doors. If the facility is located near a building, the ridge line should run east and west to minimize the shade from roof supports. The best location for a greenhouse is a southern or southeastern exposure to ensure the maximum sunlight, especially in the morning but preferably all day. The east side is the second best location where it will capture the most November to February sunlight. Also, the



SITE SELECTION IS IMPORTANT

greenhouse may be placed where it will be partly shaded during the summer months when the light reduction is not serious and may be desirable. Be sure to take into account the possibility of falling limbs which may damage the greenhouse. Another point is to position the greenhouse so that mid-winter shadows (usually twice as long as the height of the object casting them) do not fall within the structure. Careful thought must be given to the availability of electricity, water and heat. If the greenhouse is to be located some distance from the main building, permanent-type hard-surface walkways and roads are desirable. During site selection, the planner must give consideration to including the necessary facilities so that the physically handicapped person can utilize the greenhouse. It is strongly recommended that educational planners become familiar with legislation as it pertains to the physically handicapped.

It also is recommended that a "land laboratory" be considered as an important and desirable adjunct to the greenhouse facility. In the lower elementary grades and for general academic programs, a minimum of one-quarter acre should be reserved for this purpose. A vocational-oriented program will require at least two acres of ground for use as a "land laboratory."

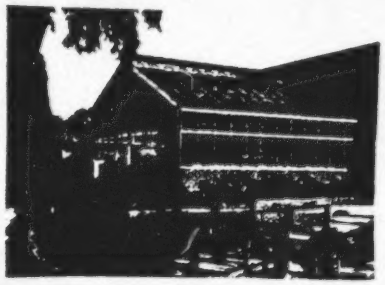
For tilling purposes, the land should be free from rock outcroppings and be reasonably level and well drained. Those school districts which desire to utilize a "land laboratory," should provide for a nursery lath house, a field plot for nursery stock, an arboretum and turfgrass demonstration area. Additional land may be necessary for crop production. Finally, careful site location planning should include the need for the storage of tools, supplies, soil bins, fertilizer, pesticides and farm equipment. The greenhouse is primarily an environmental area for plants and, therefore, should not be used for storage, potting or classroom instruction.

DESIGN

Greenhouses can be designed in many sizes, styles and shapes. The selection of design and size will be influenced by program objectives and cost considerations. Since

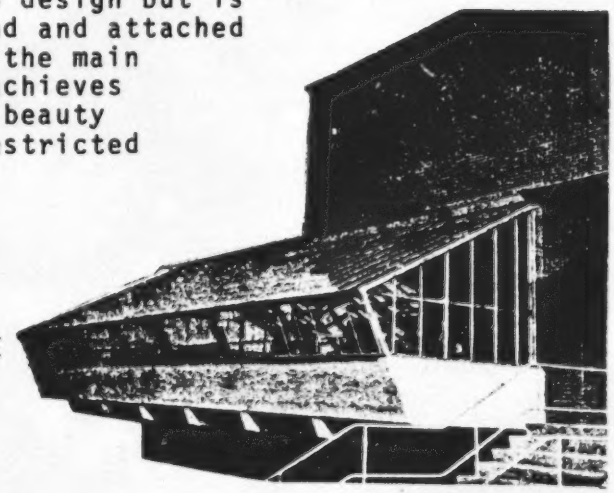
elaborate or specially designed units are expensive, it is suggested that conventional greenhouses, similar in shape, size and structure to those utilized in private industry, be provided. These are described in detail in the following paragraphs:

Even-Span: The even-span greenhouse is the one people generally visualize when they think about a greenhouse. It is similar to the free-standing structure except that it is attached to a building at one gable end of the greenhouse. This style offers great operating flexibility in both production and management.



EVEN-SPAN GREENHOUSE

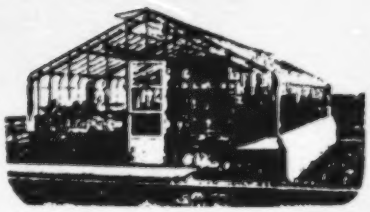
Flying-Wing: The flying-wing structure is similar to a lean-to design but is elevated from the ground and attached to a desirable area of the main building. It usually achieves striking architectural beauty and it utilized with restricted sites.



FLYING-WING GREENHOUSE

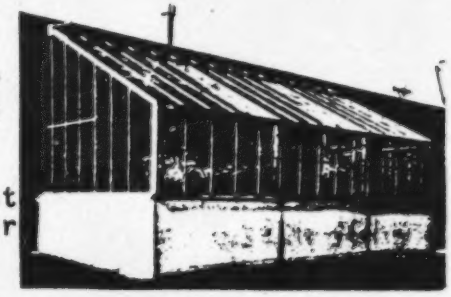
Free-Standing: The free-standing greenhouse is a separate structure which consists of side walls, end walls and gable roof. A separate and independent heating system will be necessary when the greenhouse is located a distance from the school building. However, when the greenhouse unit is located close enough to a school building, the heating

system may be connected to the school's existing heating system. The free-standing greenhouse is most widely used in industry and offers effective use of space and ease of management.



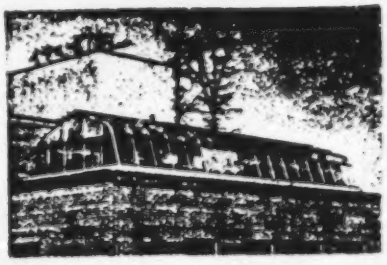
FREE-STANDING GREENHOUSE

Lean-To: The lean-to greenhouse is attached to a building using the existing structure for one or more of its sides. It can be the solution to a limited space problem. When it is located near a doorway, it can provide convenient access to the building. A further advantage of the lean-to is that it usually is close to available electricity, water, heat and toilets. They are easily adaptable to science programs which focus on biological studies where student activities range from basic science experiments, research and advanced studies.



LEAN-TO GREENHOUSE

Tower: This roof-top greenhouse is primarily constructed in urban areas to meet high land cost problems and in areas where there are space limitations. School districts usually select the even-span design greenhouse which has the adaptability to include a laboratory area for the study of animals plus appropriate storage space.



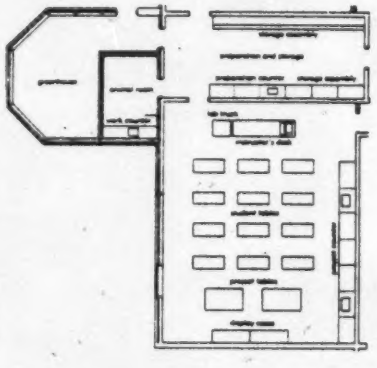
TOWER GREENHOUSE

RECOMMENDED SIZES FOR GREENHOUSES

The goals of instructional programs, the expected student enrollment and the cooperative use with other departments including community education should determine the size of the greenhouse. The following recommended sizes are to be considered as acceptable minimums for the purpose of achieving a meaningful program:

RECOMMENDED SIZES FOR GREENHOUSES

Utilization Of Facility	Minimum Acceptable Square Feet Per Pupil	Minimum Acceptable Gross Area In Square Feet	Pupil Stations
Science:	40	400	10
Elementary	40	400	10
Middle	40	400	10
Secondary	40	400	10
Vocational Agriculture	40	800	20
Ornamental Horticulture	100	2,000	20

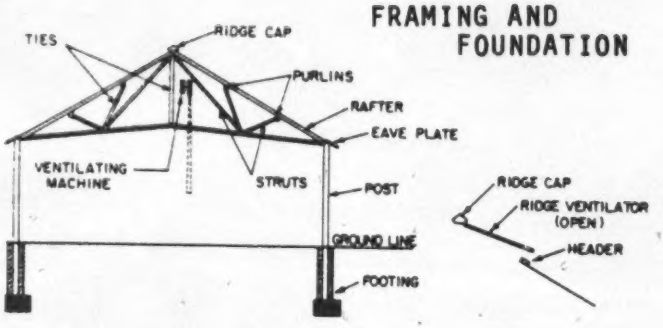


SCIENCE ROOM GREENHOUSE

A Suggested Design

CONSTRUCTION

Framing and Foundation: Various kinds of framing materials are utilized in the construction of greenhouses. Commonly used materials range from wood and aluminum to galvanized steel. Framing can be clear-span trusses, post and horizontal beam or rigid frame.



FRAMING AND FOUNDATION

The latter type of framing limits flexibility in bench arrangement. All footings, foundations and anchorage shall be done in accordance with the Guide for Schoolhouse Planning and Construction. The concrete post foundation is recommended for grade-level construction rather than expensive footings with masonry foundation and walls. However, concrete or concrete blocks are commonly used for construction foundations. Brick, concrete blocks, stone, redwood and asbestos board are popular sidewall materials.

COVERING: Glass is the traditional greenhouse covering. It is available in many designs to blend with almost any style or architecture and light transmission. Glass greenhouses may have slanted sides, straight sides and louvers or curved eaves. Aluminum, maintenance-free, clear-span, glass construction has very pleasing lines and will provide a large growing area. It offers assurance of a weather-tight structure which minimizes heat costs and retains humidity.

Fiberglass, is lightweight, strong and practically hail proof. Corrugated panels 8 feet to 12 feet long and flat fiberglass in rolls are available in 24 to 48 inch widths. Thicknesses range from 3/64 to 3/32 of an inch. Poor grades of fiberglass will discolor and this discoloring reduces light penetration. Using a good grade, on the other hand, may make the fiberglass greenhouse as expensive to build as one constructed from glass. If fiberglass is to be used, the clearest grade should be selected. The use of colored

fiberglass is not recommended.

Plastic film greenhouses are increasing in popularity. The reasons are:

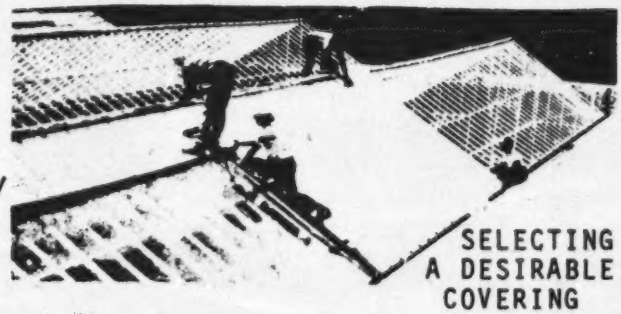
* Construction cost per square foot is generally one-sixth to one-tenth the cost of glass greenhouses.

* Plastic greenhouses can be heated as satisfactorily as glass greenhouses.

* Crops grown under the plastic cover are equal in quality to those grown under glass.

Plastic covered greenhouses can be made of polyethylene, polyvinyl chloride and copolymers of these materials and other readily available clear films.

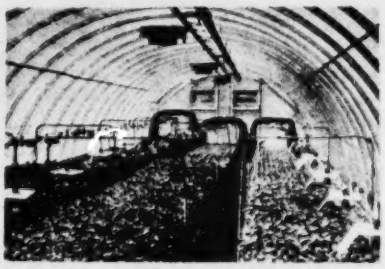
Polyethylene or vinyl covering is not recommended for use on a greenhouse. Polyethylene constantly exposed to the sun deteriorates during the summer months and must be replaced each year. Ultraviolet light energy causes polyethylene to break down. This first deterioration occurs along the rafters and along the creases where the film is folded.



SELECTING A DESIRABLE COVERING

Polyethylene permits passage of much of the reradiated heat energy given off by the soil and plants inside the greenhouse. Therefore, a polyethylene greenhouse looses heat by radiation more quickly than a glass greenhouse both during sunny periods and after sunset. This is an advantage during the day and a disadvantage at night. Most poly greenhouses are double covered and are air inflated. These houses use approximately 33 per cent to 40 per cent less energy for heating than single glazed structures.

LIGHTING: Plants respond to the relative lengths of light and dark periods as well as to the intensity and quality of light. Artificial light has been used extensively to control plant growth processes under various conditions. Plants differ in their need for light. Some thrive on sunshine while others grow best in the shade. Most plants will grow in either natural or artificial light.



LIGHTING FOR BOTH ILLUMINATION AND GROWING PLANTS

Artificial light in greenhouses may be utilized in the following ways:

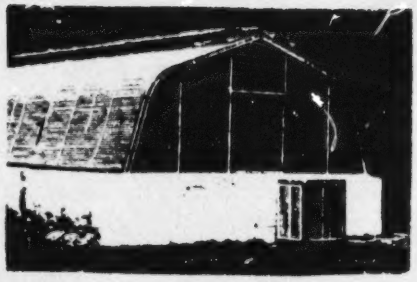
a. To provide bright intensity light when increased plant growth is desired.

b. To extend the hours of natural daylight or to provide a night interruption to maintain the plants in long-day conditions.

Incandescent or fluorescent fixtures or high-intensity discharge lamps shall provide at least 20 footcandles of uniformly distributed light. It is recommended that an emergency lighting system be installed in all greenhouse facilities when used in the evening by students and adults enrolled in continuing education programs.

HEATING: Heating systems, regardless of the fuel and distribution equipment used, are controlled by thermostats especially designed for greenhouse use. It is recommended that the temperature control accuracy be within $\pm$ 1° Fahrenheit. Greenhouses should be compartmentalized so plants having different temperature requirements may be isolated. It is recommended that school greenhouses use hot water as a source of heat because it permits more accurate temperature control. Thermostatic controls and thermometers must be shielded from the sun and equipped with tamper-proof guards to prevent inaccurate control and

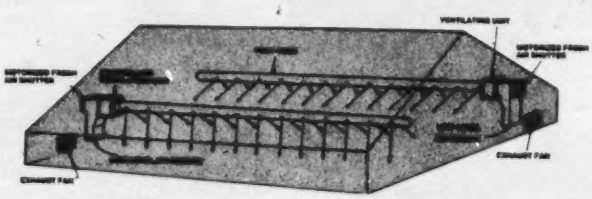
readings. An evaporative cooling system can be installed to extend the growing season when the greenhouse is used during the hot summer months. For example, crops or plantings to be flowered for fall classes are grown during summer months when artificially cooled air is essential for greenhouse crop production. Usually, an evaporative cooling system, in hot dry seasons, can reduce the temperature 30 to 40 degrees. When the season is wet and humid, the cooling will be less. In essence, an evaporation cooling system is most effective during the hottest part of the day. When separate flame-operated equipment is used, it shall be enclosed by a noncombustible floor, walls and ceiling to insure not less than a one-hour fire rating.



ROLL-UP WOODEN SLATS AND AN EVAPORATIVE COOLING SYSTEM CAN HELP CONTROL TEMPERATURES

VENTILATION: Greenhouse ventilation is required to control moisture, maintain required temperatures and minimize drafts and spot cooling to assure a functional facility. The following are some of the improved methods of ventilation which are commonly utilized:

* Sidewall vents which are automatically controlled.
* Exhaust fans with automatic controls and matching inlet vents automatically.
* Fan-jet or poly-plastic connection tubes running the length of the greenhouse under the ridge.

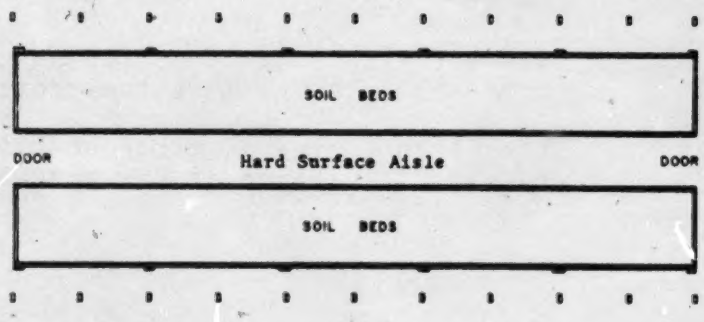


VENTILATING WITH THE POLY-PLASTIC TUBE

The required air supply for greenhouses during periods of occupancy is as follows: standard air (tempered outside air) shall be at the rate of not less than .25 CFM per square foot supply and general exhaust with a system capacity of not less than 1.5 CFM per square foot.

To provide for optimum temperature control within limits for all season ventilation, exhaust fan ventilation systems are most desirable and require one air change (volume) per minute.

FLOORS AND BENCHES: Greenhouses should be constructed on ground level with earth floors to absorb and evaporate moisture. Where floors are constructed from other materials, proper drainage should be provided. Unused earth areas under benches should be treated to kill weeds before covering the ground with crushed stone or pebbles. Crushed rock and pebbles can be used effectively to cover the ground under benches, to drain off excess water and to provide humidity. Hard surface aisles and walkways should be provided. The walks should be raised and sloped to allow quick run-off of water. All aisles and walkways shall measure not less than 48 inches to provide ample width for use by the physically handicapped. Generally, 50 per cent of the floor area should be allotted to planting beds. Benches may be used in lieu of floor beds. To minimize deterioration, benches should be constructed from cedar, cypress, redwood or asbestos board. Locally available lumber may be utilized if a suitable wood preservative is used. Never use creosote or pentachlorophenol in the greenhouse. Benches are usually 4 feet to 5 feet wide and arranged in patterns which will provide for the most effecient use of available space. It is desirable to utilize benches

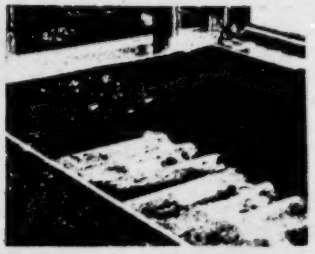


GREENHOUSE LAYOUT SHOWING HARD-SURFACE AISLE AND SOIL BEDS

which can be moved to form new patterns when desired.

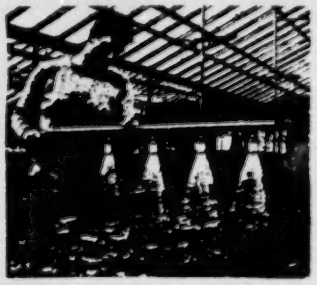
A CONCRETE BENCH WITH SLITS FOR DRAINAGE

Consideration should always be given to adjustable benches and equipment which can be used by the physically handicapped person.



CORRUGATED ASBESTOS CEMENT PIPE FRAME BENCH

WATERING: The germination of seeds and the rooting of should be done under a fine spray of water distributed by means of a misting system. Greenhouse operators may save considerable time and expense by fertilizing plants while watering them. This can be done by injecting a concentrated fertilizer solution into the irrigation line so that the plants are given diluted fertilizer at every watering. Schools may find it advantagous to install semi-automatic devices to provide mechanical supervision of the watering of greenhouse plantings. An anti-back siphoning device is essential to keep the water systems separate and safe for drinking.



WATERING WITH A FINE SPRAY

ELECTRICAL: It is recommended that 110 volt electrical outlets be placed at intervals along the walls. A 220 volt outlet is suggested for location at a central point on the wall to accommodate a soil pasteurizer. For safety, all electrical outlets should be waterproof and all electrical installations must comply to the National Electrical Code.

RELATED GREENHOUSE FACILITIES

INTRODUCTION

Elementary, middle and high school educational programs usually can be conducted in the regular classroom with appropriate supporting greenhouses. The vocational-technical school program may require additional skills and training and find it necessary to expand facilities beyond those of the classroom and greenhouse, particularly if extended and advanced training courses are to be offered. These facilities are identified in the following paragraphs exemplifying their basic intended uses.

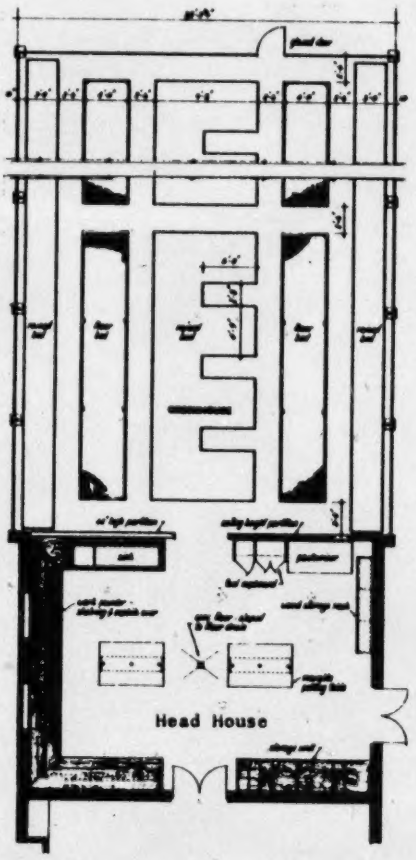
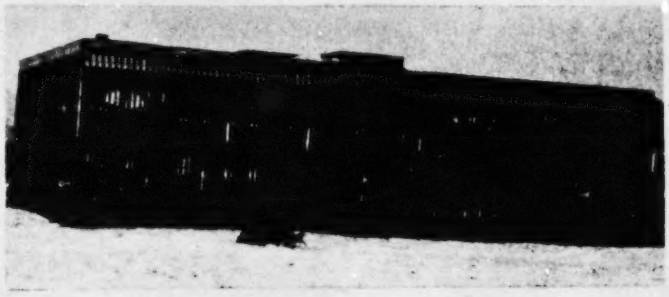


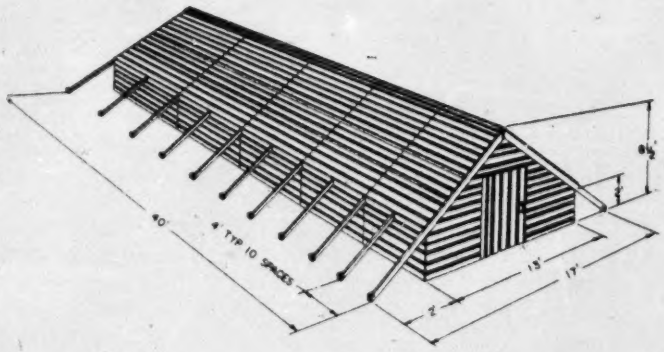
ILLUSTRATION OF A HEAD HOUSE ATTACHED TO A GREENHOUSE

HEAD HOUSE: Head houses are shops which provide classroom areas for instruction in agriculture, horticulture and agribusiness. The head house structure should be connected directly to the greenhouse. The recommended acceptable minimum size for this laboratory facility is 1,600 square feet. Additional space should be provided for plant propogation, potting of plants, flower arranging and other essential activities for growing greenhouse plants. Careful consideration should be given to the allotment of space for the storage of tools, soil bins, fertilizers, sand bins and other materials needed for the greenhouse operation. In the process of designing the head house, thought should be given to providing approximately 100 square feet for office-conference activities and office space for each teacher.

LATH HOUSE: A lath house is constructed from wood laths that are separated to allow light to enter the structure. The minimum recommended size for the lath house is 300 square feet. However, the structure should be large enough to accommodate the educational program to be provided for the students. Its main purpose is to shelter certain kinds of plants which require modified shading. It is important that lath strips be constructed in a north-south direction so that the plants are exposed to moving alternate patterns of sun and shade. The installation of hard-surface walkways and a water outlet are desirable. Usually two soil beds separated by a walkway are sufficient for the educational program.



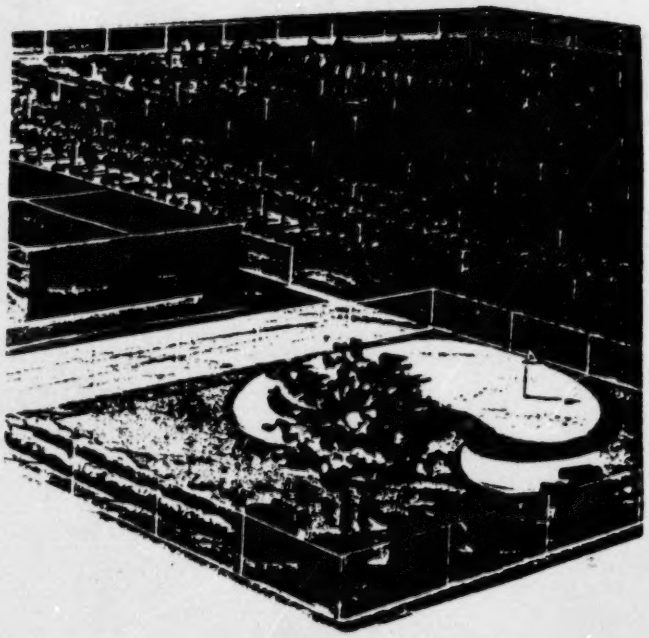
FLAT-TOP LATH HOUSE



A-FRAME LATH HOUSE

LAND LABORATORY: The minimum recommended size for a vocational-technical school land laboratory is approximately two acres. This recommended minimum acreage allows ample space to grow many species of nursery plants.

LATH HOUSE, LAND LABORATORY AND TURFGRASS DEMONSTRATION AREA



NURSERY STOCK AREA: It is recommended that a paved area of approximately 2,500 square feet be provided for the storage of potted plants, shrubs and trees. An asphalt base is recommended because of its heat retention properties. Portable cold frames or quonset-style polyethylene film covered frames should be provided for winter protection.

ARBORETUM FACILITY: An arboretum is an area where trees and plants are grown for scientific and educational purposes. Any part of the school site may be used as an arboretum or a specially designated plot of land may be set aside for this purpose. The arboretum is a desirable instructional facility for use by students seeking occupations in nursery contracting, nursery production, landscape nurseries and garden stores.

COLD FRAME GLAZED WITH CORRUGATED FIBERGLASS PANELS-COVERS LIFT OFF OR SLIDE FOR VENTILATION CONTROL

TURFGRASS DEMONSTRATION AREA: Turfgrass plots for demonstration require about one acre of land if instruction is given in turfgrass maintenance, weed control, fertility and cultural practices. Generally, this phase of instruction is part of the ornamental horticulture program. A turfgrass demonstration area may accommodate a golf course of one to several holes which will require at least one acre per hole.

PROGRAMS

ELEMENTARY SCHOOL

The elementary school program is believed to be the most effective when the curriculum emphasizes a discovery approach and first-hand experiences. It is a time when children want to explore and it is a time of self-discovery. Current trends place emphasis on individual and small group student activities rather than on large-group learning. Space and materials are needed for such activities as planting, watching things grow and observing and caring for animals. As in all curriculum planning, goals must be developed which indicate directions. Teachers and curriculum planners must have some concept of the directions in which they hope their students will develop.

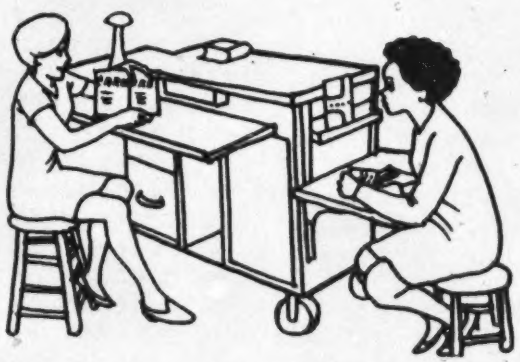
SMALL GROUP ACTIVITIES ARE DESIRABLE TO THE TEACHING PROCESS

In both the science program and the pre-agriculture program, the statement of goals should have operational meanings; i.e., they should have meanings in terms of our day-to-day work in teaching these areas. In the past, the natural sciences have been taught in the schools as a body of classified knowledge rather than as an approach to problem-solving and as a means of learning how and why things happen in the natural world. A greenhouse can be utilized effectively as a vehicle to foster interest in agriculture and horticulture and to teach young students the ability man has to control nature as well as himself.

For this age level, the greenhouse program can be developed as an integral and simple model for career education. The program planner can put emphasis on the reflections of our man-made environment, the impact of simple technology; understanding, in elementary terms, the world of work and the dignity of work.

MIDDLE SCHOOL

An effective middle school science and exploratory agriculture sequence of courses can be a key factor in the development of programs for other school levels. In some cases, it may be the last opportunity students have to study the broad range of sciences. Clearly, courses must be structured in terms of what students learned in the elementary school and they must prepare students for their selected science courses in the high school. Career exploration programs should be expanded and taught on a more sophisticated level to greater knowledge of skill potential and greater self-awareness. It is very important at this level when abstract thinking skills are emerging, to develop student understanding of and skill in the decision-making process. Of major importance is the need for the educational planner to keep abreast of the likely employment opportunities in natural resources and/or agricultural business and services in New Jersey and throughout the nation and to plan instructional programs accordingly.



MIDDLE SCHOOL STUDENTS SHOULD BECOME FAMILIAR WITH CAREERS IN THE NATURAL SCIENCE FIELD

In summary, there are five basic broad personal development and competency goals which should be incorporated into the learning process as they pertain to both career education and the learning activities. These basic or primary goals are:

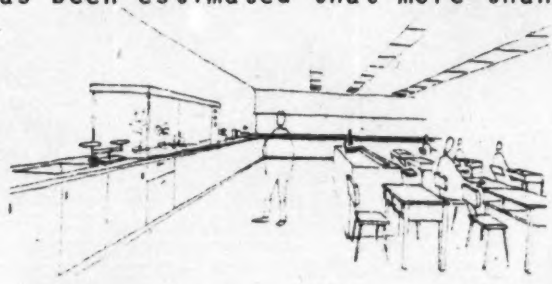
1. Basic Education Skills (mathematic and communication skills)

2. Career Awareness
3. Self-Awareness
4. Appreciation, Work Attitude and Habits
5. Decision Making

HIGH SCHOOL AND ADULT SCHOOL

Career education on the high school level requires more concentrated methods of study, more sophisticated evaluation techniques, in depth testing of tentative choices and expanding development of specific employment competencies and/or foundations for continuing education. In the postgraduate work of adults, effort is directed toward education and work blended as cocomitant functions in a continuous process of attending to individual career development needs. This effort is generally tied to new scientific developments and the desire to acquire new skills for position and income advancement.

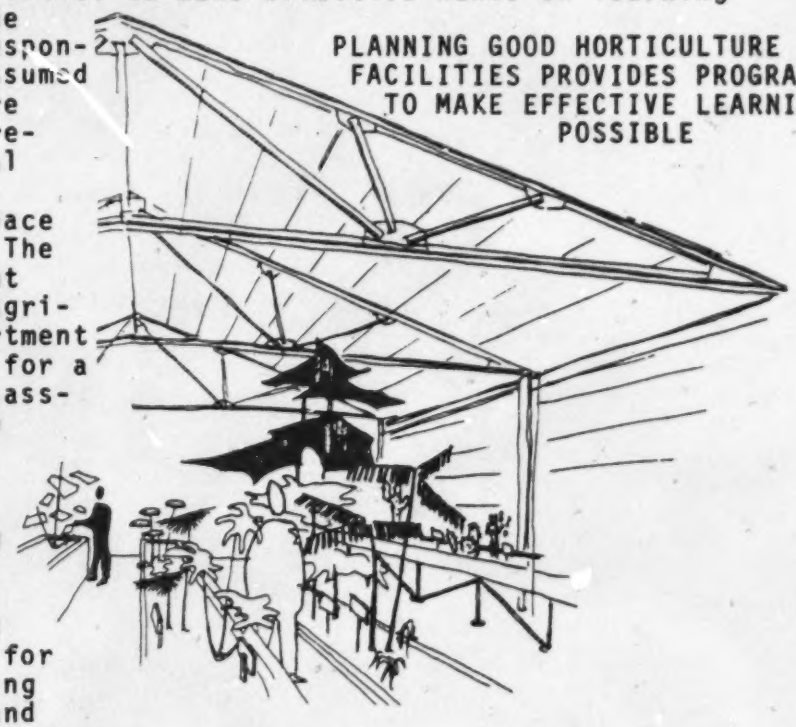
The science of biology has occupied a strategic place in the high school curriculum. It has been estimated that more than 90 per cent of America's high schools offer a course in biology and 8 out of every 10 high school students than is enrolled in any other senior high school biology course is the last formal science course taken. Therefore, it is educationally justifiable that schools consider constructing a greenhouse as part of the instructional facilities. To obtain the best results from experiments involving living organisms, they should be raised and maintained under optimum environmental conditions. The class and laboratory rooms in a school cannot be planned to solely provide the best living conditions for plants and animals. Greenhouses are designed to provide conditions in which light, temperature, humidity and air circulation may be regulated specifically for plants and animals.



BIOLOGY HAS OCCUPIED A STRATEGIC PLACE IN THE HIGH SCHOOL CURRICULUM

Due to new technology, broader concepts, the changing agriculture scene and greater emphasis on career education, there is a stronger demand for adequately trained personnel. Coupled with this demand is the fact that there has been a stable and steady increase of full-time jobs available in related fields to graduating students. Positions are most attractive in professional, sales and managerial areas where the highest salaries are paid to employees.

The quality of any natural resources and/or agriculture programs is dependent to a large extent on how well the school provides facilities to make effective hands-on learning possible. The variety of responsibilities assumed by agriculture departments requires special attention to design and space allocation. The physical plant housing the agriculture department must provide for a variety of classroom and shop experiences suitable for high school pupils, young farmers and other adults for 12 months of the year, for day and evening instruction and meetings.



PLANNING GOOD HORTICULTURE FACILITIES PROVIDES PROGRAMS TO MAKE EFFECTIVE LEARNING POSSIBLE

In planning horticulture utilization of the agriculture facilities, schools should consider one or more of the following instructional programs: Introduction to Ornamental Horticulture, Nursery Production, Landscape Maintenance and Establishment, Landscape Design, Turfgrass Establishment and Maintenance, Garden Store Operation, Arboriculture and Flower Shop Operation and Management.

The head house can be used effectively for providing individual experiences to develop mechanical skills and understanding essential to the maintenance, adjustment, operation and repair of farm machinery and equipment.

National leaders in agriculture education have identified five areas of instruction essential to the effective teaching of mechanical skills. They are: (1) Power and Machinery, (2) Farm Buildings and Conveniences, (3) Soil and Water Management, (4) Rural Electrification and Processing and (5) Agricultural Construction and Maintenance.

OCCUPATIONAL TITLES

The following list of occupational titles are listed below to assist the educational planner in developing students for job entry. Programs may be developed to upgrade occupational skills or prepare the learner for further occupational preparation:

Production Oriented Occupations	Sales & Service Occupations
Greenhouse Worker	Flower Shop Worker
Nursery Worker	Florist
Nursery Owner	Garden Center Manager
Vegetable Producer	Horticultural Products Sales Person
Greenhouse Worker	Vegetable Market Manager
Christmas Tree Producer	Fruit Market Manager
Turf Producer	Fruit Market Employee
Tree Farmer	Floral Arrangement Specialist
Greenhouse Owner	Produce Department Manager
Flower Production Employer	Grocery Store Delivery Man
Bedder	Lawn and Garden Center Employee
Fruit Producer	
Mushroom Grower	
Nursery Employee	
Wholesale Flower Producer	

Technical Oriented Occupations	Related Occupations
Greenskeeper	Landscaping Assistant
Agronomist	Landscape Gardener
Equipment Mechanic	Athletic Field Groundskeeper
Plant Propagator	Teaching (Vo-Ag Instructor)
Lawn Specialist	Industrial Grounds Maintenance Person
Tree Surgeon	Golf Course Employee
Tree Sprayer	City, State and National Park Employee
Tree Pruner	State Gardener
Landscape Architect	Highway Maintenance Person
Arborist	Park Superintendent
Pest Control Technician	Groundskeeper
Inspector	Director of Seed Company
Research	Editor-Horticultural Publications
Extension Specialist	Landscape Construction
Landscape Designer	Physical Plant Manager
Landscape Consultant	Chemical Company Representative
Plant Breeder	Horticultural Equipment Sales
Lab Technician	Landscape Contractor
	Horticultural Products Broker

SUMMARY

This bulletin has discussed the numerous uses of greenhouses, ideas on design and construction, the growing demand for primary and supporting facilities, evolving job classifications, recommended acceptable minimum square footages for the various kinds of facilities. To summarize, the general conclusions as they relate to a greenhouse facility are:

1. Greenhouse facilities should be considered an important integral part of elementary, middle and high school programs.

2. Careful consideration should be given to post-secondary and adult education programs when planning greenhouse construction.

3. Programs for greenhouse utilization should include activities for both general and occupationally oriented students.

4. Educational specifications should be written in the early planning stage. To assist the educational planner in developing a comprehensive set of educational specifications, a Bulletin on this subject is available from the Bureau of Facility Planning Services, New Jersey State Department of Education.

5. A site and/or location should be selected for the greenhouse. Educational specifications should be used as the criteria for the selection process.

6. The size and design of the greenhouse will be influenced by program objectives. Consideration should be given to future expansion and supporting facilities.

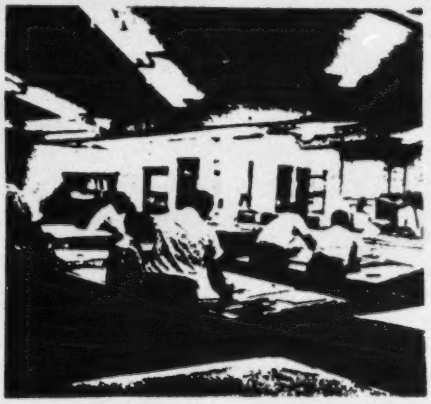
7. It is the responsibility of the local Board of Education to retain a registered architect to design the greenhouse facility in accordance with approved educational specifications developed by the local school district.

8. Plans and specifications for the greenhouse must conform to the regulations and standards set forth in the GUIDE FOR SCHOOLHOUSE PLANNING AND CONSTRUCTION, and shall be

submitted to the Bureau of Facility Planning Services for review and approval.

9. Preliminary and final inspections will be made of the facility by Bureau inspectors and an Occupancy Permit will be issued by the New Jersey State Board of Education when the greenhouse is completed and ready for pupil occupancy.

PLANS AND SPECIFICATIONS MUST CONFORM TO REGULATIONS AND STANDARDS AS SET FORTH IN THE GUIDE FOR SCHOOLHOUSE PLANNING AND CONSTRUCTION



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